

Applicants : John P. Biel, Jr. et al
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Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings of claims in this application.

Listing of Claims:

Claims 1-5 (canceled)

Claim 6 (previously presented) A thermally-activated exhaust treatment device adapted to control exhaust emissions in a vehicle comprising:

an inner housing having a first inlet and a first outlet defining a longitudinal direction and having an exhaust treating device therein chosen to reduce emissions from the exhaust of a combustion engine as the exhaust passes from the first inlet to the first outlet;

an outer housing enclosing the inner housing but characteristically not contacting the inner housing, the outer housing including a second inlet and a second outlet that align with the first inlet and the first outlet of the inner housing, the inner and outer housings including walls forming a sealed insulation cavity around the inner housing, the insulation cavity having a vacuum drawn therein; and

a passive, temperature-activated variable insulator device positioned within the outer housing and in communication with the insulation cavity, the variable insulator device including a hydrogen source that obviates a need for separate electrical wiring and controls for

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controlling the temperature of the variable insulator device, wherein the insulator device includes a hydride comprising a reversible hydride located in a confined space defined between the first and second outlets, the insulator device including a wire mesh member in the confined space, and further including a containment ring in the confined space configured to hold the wire mesh in the space, the containment ring including holes permitting passage of hydrogen from the hydride to a remaining part of the insulation cavity.

Claims 7-8 (canceled)

Claim 9 (previously presented) A thermally-activated exhaust treatment device adapted to control exhaust emissions in a vehicle comprising:

an inner housing having a first inlet and a first outlet defining a longitudinal direction and having an exhaust treating device therein chosen to reduce emissions from the exhaust of a combustion engine as the exhaust passes from the first inlet to the first outlet;

an outer housing enclosing the inner housing but characteristically not contacting the inner housing, the outer housing including a second inlet and a second outlet that align with the first inlet and the first outlet of the inner housing, the inner and outer housings including walls forming a sealed insulation cavity around the inner housing, the insulation cavity having a vacuum drawn therein; and

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a passive, temperature-activated variable insulator device positioned within the outer housing and in communication with the insulation cavity, the variable insulator device including a hydrogen source that obviates a need for separate electrical wiring and controls for controlling the temperature of the variable insulator device, the hydrogen source including a hydride located in a confined space defined inside the outer housing, and further including a wire mesh member in the confined space, and still further including a containment ring in the confined space configured to hold the wire mesh member in the space, the containment ring including holes permitting passage of hydrogen from the hydride to a remaining part of the insulation cavity.

Claim 10 (previously presented) The device defined in claim 9, wherein the insulator device includes a getter.

Claim 11 (previously presented) The device defined in claim 10, wherein the hydride is combined with the getter.

Claim 12 (original) A device adapted to control exhaust emissions in a vehicle comprising:

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an inner housing having a first inlet and a first outlet defining a longitudinal direction and having an exhaust treatment device therein chosen to reduce emissions from the exhaust of a combustion engine as the exhaust passes from the first inlet to the first outlet;

an outer housing enclosing the inner housing but characteristically not contacting the inner housing, the outer housing including a second inlet and a second outlet that align with the first inlet and the first outlet of the inner housing, the inner and outer housings including walls forming a sealed insulation cavity around the inner housing, the insulation cavity having a vacuum drawn therein; and

a vacuum maintenance device incorporated into the insulation cavity, the vacuum maintenance device including a container, getter material positioned in the container, a porous member allowing gas in the insulation cavity to communicate with the getter material, and a gate covers the porous member to prevent the gas in the insulation cavity from communicating with the getter material, the gate having a high melting point such that the insulation cavity can be pumped-down, baked, and sealed at a lower first temperature and then the gate can be melted away to uncover the porous member at a higher second temperature.

Claim 13 (original) The device defined in claim 12, wherein the gate includes material selected from a group consisting of Magnesium and Aluminum.

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Claim 14 (original) The device defined in claim 12, wherein the gate includes a brazing material.

Claims 15-16 (canceled)

Claim 17 (currently amended) The device defined in claim 12, including a multi-layered radiation shield comprised of alternating layers of insulation material and radiant energy reflective materials is positioned in the insulation cavity around the inner housing, at least a portion of the radiation shield being spaced away from the inner housing to define a passageway between the shield and the inner housing where [[the]]hydrogen is permitted to flow to provide increased heat transfer when the treatment device reaches the predetermined temperature.

Claim 18 (original) The device defined in claim 17, wherein the alternating layers include at least two layers of insulation material.

Claim 19 (original) The device defined in claim 17, wherein the insulation material is selected from a group consisting of ceramic and fiberglass paper.

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Claim 20 (original) The device defined in claim 17, wherein the reflective material is selected from a group consisting of copper and aluminum foil.

Claim 21 (currently amended) The device defined in claim 17, wherein the radiation shield includes channels formed to permit flow of [[the]]hydrogen around the radiation shield and between the radiation shield and the inner housing.

Claim 22 (original) The device defined in claim 17, including bands loosely attaching the radiation shield to the inner housing.

Claim 23 (original) The device defined in claim 17, including radially-extending supports extending through the radiation shield between the inner and outer housings.

Claim 24 (previously presented) The device defined in claim 17, wherein the radiation shield is cut longitudinally into separate parts that are configured to mateably engage and cover opposing portions of the inner housing.

Claim 25 (currently amended) The device defined in claim 12, including a radiation shield placed in the insulation cavity[[vacuum space]] and includes a center portion, a

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separated inlet end portion and a separated outlet end portion that overlap the center portion to form a continuous barrier to radiation loss of heat from the inner housing, the center portion being located between the first and second sidewalls, the inlet end portion being located at the first and second inlet end cones, and the outlet end portion being located at the first and second outlet end cones.

Claim 26 (original) The device defined in claim 25, wherein the radiation shield includes multiple layers, and wherein the center portion has more layers than the inlet end portion and the outlet end portion.

Claim 27 (previously presented) The device defined in claim 25, wherein the center portion is cylindrically shaped and includes longitudinal edges that overlap inboard edges of the inlet end portion and the outlet end portion.

Claim 28 (original) The device defined in claim 25, wherein the radiation shield is multi-layered, and includes at least one layer of insulative material and at least one layer of thermal energy reflective material.

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Claim 29 (previously presented) The device defined in claim 25, wherein the radiation shield is cut longitudinally into separate parts that are configured to mateably engage and cover opposing portions of the inner housing.

Claim 30 (currently amended) The device defined in claim 12, including a radiation shield with gas passages, the radiation shield being extended around the ~~phase change material and the inner housing~~, the radiation shield including portions spaced away from and defining passageways adjacent the phase change material and the inner housing that are configured to assist with thermal communication between the exhaust treatment device and the outer housing primarily through hydrogen gas conductance.

Claim 31 (previously presented) The device defined in claim 30, wherein the radiation shield is cut longitudinally into separate parts that are configured to mateably engage and cover opposing portions of the inner housing.

Claim 32 (previously presented) The device defined in claim 30, wherein the radiation shield surrounds and is loosely coupled to the inner housing.

Claim 33 (previously presented) The device defined in claim 12, including a vacuum

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detector operably connected to the insulation cavity, the vacuum detector including a visible indicator of the vacuum in the insulation cavity.

Claim 34 (previously presented) The device defined in claim 33, wherein the visible indicator includes a member sufficiently flexible to show a vacuum-drawn dimple.

Claim 35 (original) The device defined in claim 33, wherein the vacuum detector comprises a cap that seals the insulation cavity and that includes a member that responds to the presence of a vacuum to show that the vacuum exists.

Claim 36 (original) The device defined in claim 33, wherein the exhaust treatment device includes a catalytic material.

Claims 37-38 (canceled)

Claim 39 (previously presented) The device defined in claim 12, wherein the porous member includes a porous cover.

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Claim 40 (previously presented) A thermally-activated exhaust treatment device adapted to control exhaust emissions in a vehicle comprising:

an inner housing having a first inlet and a first outlet defining a longitudinal direction and having an exhaust treating device therein chosen to reduce emissions from the exhaust of a combustion engine as the exhaust passes from the first inlet to the first outlet;

an outer housing enclosing the inner housing but characteristically not contacting the inner housing, the outer housing including a second inlet and a second outlet that align with the first inlet and the first outlet of the inner housing, the inner and outer housings including walls forming a sealed insulation cavity around the inner housing, the insulation cavity having a vacuum drawn therein; and

a passive, temperature-activated variable insulator device positioned within the outer housing and in communication with the insulation cavity, the variable insulator device including a hydrogen source that obviates a need for separate electrical wiring and controls for controlling the temperature of the variable insulator device, the hydrogen source including a hydride located in a confined space defined inside the outer housing, and further including a porous cover covering the confined space and configured to hold the hydride in the space, the porous cover including holes permitting passage of hydrogen from the hydride to a remaining part of the insulation cavity.

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Claim 41 (previously presented) The device defined in claim 40, wherein the porous cover includes a containment ring with holes therein.

Claim 42 (previously presented) A device adapted to control exhaust emissions in a vehicle comprising:

an inner housing having a first inlet and a first outlet defining a longitudinal direction and having an exhaust treatment device therein chosen to reduce emissions from the exhaust of a combustion engine as the exhaust passes from the first inlet to the first outlet;

an outer housing enclosing the inner housing but characteristically not contacting the inner housing, the outer housing including a second inlet and a second outlet that align with the first inlet and the first outlet of the inner housing, the inner and outer housings including walls forming a sealed insulation cavity around the inner housing, the insulation cavity having a vacuum drawn therein; and

a vacuum maintenance device incorporated into the insulation cavity, the vacuum maintenance device including a container, getter material positioned in the container, a porous member allowing gas in the insulation cavity to communicate with the getter material, and a thin sheet that covers the porous cover to prevent the gas in the insulation cavity from communicating with the getter material, the thin sheet having a high melting point such that the insulation cavity can be pumped-down, baked, and sealed at a lower first temperature and then

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the thin sheet can be melted away to uncover the porous cover when heated to a higher second temperature.

Claim 43 (previously presented) The device defined in claim 42, wherein the container is located proximate the first and second outlets in a location where the exhaust exiting the treating device will heat and activate the hydride.

Claim 44 (currently amended) The device defined in claim 42, including a multi-layered radiation shield comprised of alternating layers of insulation material and radiant energy reflective materials is positioned in the insulation cavity around the inner housing, at least a portion of the radiation shield being spaced away from the inner housing to define a passageway between the shield and the inner housing where [the]]hydrogen is permitted to flow to provide increased heat transfer when the treatment device reaches the predetermined temperature.

Claim 45 (currently amended) The device defined in claim 42, including a radiation shield placed in the insulation cavity~~vacuum space~~ and includes a center portion, a separated inlet end portion and a separated outlet end portion that overlap the center portion to form a continuous barrier to radiation loss of heat from the inner housing, the center portion being

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located between the first and second sidewalls, the inlet end portion being located at the first and second inlet end cones, and the outlet end portion being located at the first and second outlet end cones.

Claim 46 (currently amended) The device defined in claim 42, including a radiation shield with gas passages, the radiation shield being extended around ~~the phase change material and the inner housing~~, the radiation shield including portions spaced away from and defining passageways adjacent the phase change material and the inner housing that are configured to assist with thermal communication between the exhaust treatment device and the outer housing primarily through hydrogen gas conductance when the emissions treatment device generating an exothermic reaction.

Claim 47 (previously presented) The device defined in claim 42, including:
a vacuum detector operably connected to the insulation cavity, the vacuum detector including a visible indicator of the vacuum in the insulation cavity.

Claim 48 (currently amended) The device defined in claim 40, including a multi-layered radiation shield comprised of alternating layers of insulation material and radiant energy reflective materials is positioned in the insulation cavity around the inner housing, at least a

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portion of the radiation shield being spaced away from the inner housing to define a passageway between the shield and the inner housing where [[the]]hydrogen is permitted to flow to provide increased heat transfer when the treatment device reaches the predetermined temperature.

Claim 49 (currently amended) The device defined in claim 40, including a radiation shield placed in the insulation cavity~~vacuum space~~ and includes a center portion, a separated inlet end portion and a separated outlet end portion that overlap the center portion to form a continuous barrier to radiation loss of heat from the inner housing, the center portion being located between the first and second sidewalls, the inlet end portion being located at the first and second inlet end cones, and the outlet end portion being located at the first and second outlet end cones.

Claim 50 (currently amended) The device defined in claim 40, including a radiation shield with gas passages, the radiation shield being extended around the phase change material and the inner housing, the radiation shield including portions spaced away from and defining passageways adjacent ~~the phase change material and the inner housing~~ that are configured to assist with thermal communication between the exhaust treatment device and the outer housing

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primarily through hydrogen gas conductance when the emissions treatment device generating an exothermic reaction.

Claim 51 (previously presented) The device defined in claim 40, including:

a vacuum detector operably connected to the insulation cavity, the vacuum detector including a visible indicator of the vacuum in the insulation cavity.

Claim 52 (previously presented) The device defined in claim 9, including a multi-layered radiation shield comprised of alternating layers of insulation material and radiant energy reflective materials is positioned in the insulation cavity around the inner housing, at least a portion of the radiation shield being spaced away from the inner housing to define a passageway between the shield and the inner housing where the hydrogen is permitted to flow to provide increased heat transfer when the treatment device reaches the predetermined temperature.

Claim 53 (previously presented) The device defined in claim 9, including:

a vacuum detector operably connected to the insulation cavity, the vacuum detector including a visible indicator of the vacuum in the insulation cavity.

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Claim 54 (previously presented) The device defined in claim 9, wherein the confined space and the containment ring include portions extending circumferentially around the first inlet.

Claim 55 (canceled)

Claim 56 (previously presented) The device defined in claim 40, wherein the confined space and the porous cover include portions extending circumferentially around the first inlet.

Claim 57 (previously presented) The device defined in claim 42, wherein the container and the thin sheet include portions extending circumferentially around the first inlet.